

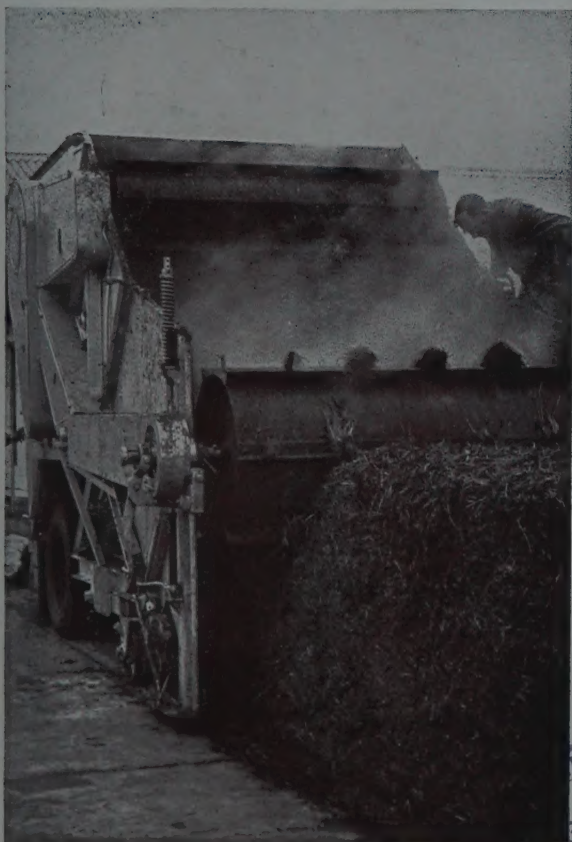
DARLINGTON'S

Mushroom News

A QUARTERLY JOURNAL FOR MUSHROOM GROWERS

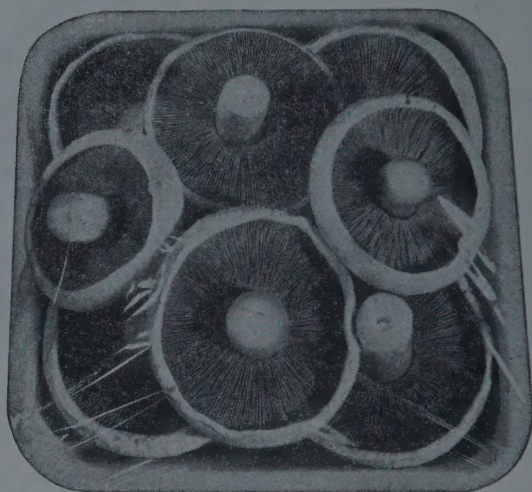
Vol. VIII No. 1

JULY 1960



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Mushroom News

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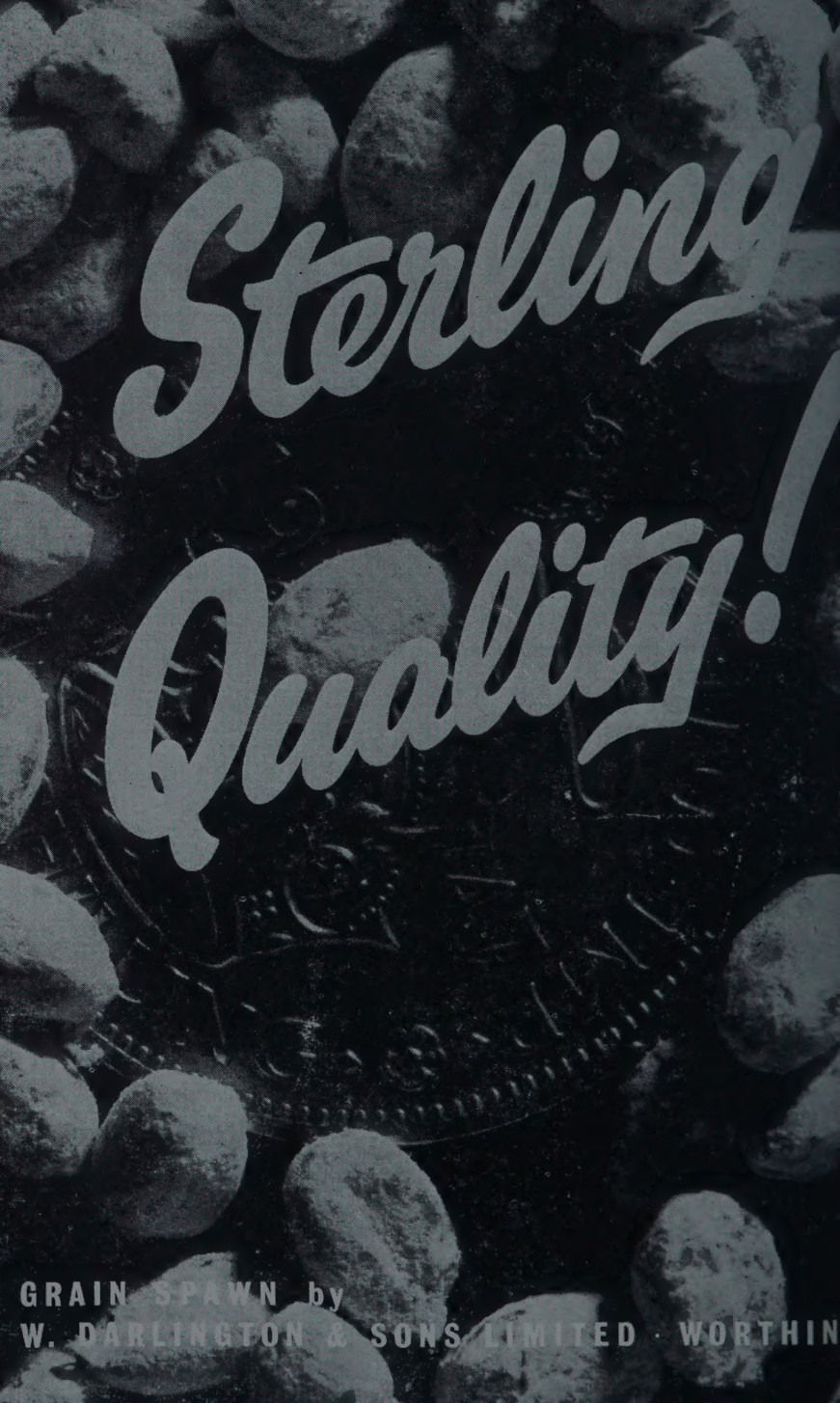
OUR FRONT COVER

Automation on the mushroom farm! The Linfield Turner now in use at Heather Farm feeds itself, adds the correct amount of water, turns the manure and discharges it into a correctly formed stack. Mr. Clifford King can be seen through the steam checking that all is in order.

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July 1960

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Sterling Quality!

GRAIN SPAWN by
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Mushroom News

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Vol. VIII No. 1

JULY 1960

The Compost

There was once a grower who thought that if only he could spend enough money on machinery, he would be able to grow mushrooms and make a profit. In a short space of time he had a remarkable farm with more machinery to the square foot of bed than any other for fifty miles around. But despite the highest capital investment of any mushroom grower of comparable size he was forced into liquidation and the reason for his failure was a very simple one—he could not make a compost.

There are almost as many ways of growing mushrooms as there are mushroom growers, but there is one common factor to all those who grow mushrooms successfully and that is the preparation of a good compost. It does not matter whether they compost in ten, twenty or thirty days, whether they grow on shelves, trays or ridge beds, whether they case with peat or soil, the firm base of their success is their compost.

Despite the vital importance of the compost it is surprising how many growers there are who do not often go near their manure heaps, leaving the supervision of watering

and turning to someone else. There is no other part of the process of growing that will yield such a liberal return as close personal attention to composting.

Temperature control, watering, ventilation—all these too are important. But with a poor compost ideal conditions and perfect treatment are almost worthless.

Time spent in the composting yard is seldom wasted.

Economic Aspect

The actual growing of mushrooms demands so much of a grower's attention that he rarely finds time to step back clear of the trees and take a good look at the forest as a whole. With this in mind we recommend that every thoughtful grower reads Mr. R. R. W. Folley's latest report*. He may not necessarily agree with what Mr. Folley has to say but at least the substance of the report is both penetrating and provocative.

The problem as stated by Mr. Folley is no longer that of adequate

**"Commercial Horticulture in Great Britain: Its Character and Competitive Strength" The Secretary, Wye College, Ashford, Kent, 7s. 6d. post free.*

economic production from home sources but of securing adequate incomes and an adequate size of business for the more intensive grower at home. The answer, he concludes, lies in a combination of higher quality of produce, speedier means of marketing and more economic growing methods.

Now this has been said many times before in many places yet there seems to be practically no co-ordinated effort towards achieving the triple goal. Nevertheless recent events have shown that it is later than most growers think and that the government will be compelled to make concessions to Europe in agriculture and horticulture if our manufacturing industries are not to suffer. The next ten years are likely to see some basic changes in the economic relationship between the United Kingdom and Europe. Mr. Folley has done a service to growers in reviewing such possible changes and studying their probable effect upon horticulture.

Reviewing marketing, Mr. Folley writes: "As yet the horticultural industry is further from its public, and from knowing their desires and how to express them in money, than most other food industries." Action in this sphere can come only as the result of working together and it is an unfortunate trait of the English-speaking peoples that they invariably display a disunited front until one minute to midnight. Subsequent efforts usually pull us through but at the cost of considerable avoidable misery and dislocation. The Horticultural Marketing Council can at the very least do something to help in this direction if only growers will pull together and agree on some sort of common direction.

Obviously there must be a considerable rationalisation of the marketing system, and this is particularly so in the case of mushrooms which have the very short life of soft fruit without the concentrated seasonal demand that clears the latter. Mr. Folley foresees that such rationalisation will take the line of a much more clear-cut division between local and national marketing. The larger producers will take advantage of the streamlining of national marketing which it is sincerely hoped will occur in the next few years, while smaller growers will tend to concentrate on local markets into which it will not be profitable for the national distribution chain to penetrate.

The mushroom grower, as always, finds himself in a special category. He is an intensive grower within the meaning of Mr. Folley's report, yet he remains unthreatened by imports. This privileged position need not necessarily last for ever, for modern methods give his product an increasing shelf life and therefore will open the door to increased foreign competition. To the over-production within the industry may be added not only imports from France and Holland, but also new production from intensive glasshouse growers who will switch to mushroom growing if they find their own specialities uneconomic.

The next ten years will be a period of adjustment in horticulture, either forced on the industry by the pressure of economic events or carried out by the industry to forestall dislocation. In Mr. Folley's opinion the industry could emerge from this period to liberalised trading by maintaining output at 90 to 95 per cent of the present level at the cost of about 10 per cent of the present land and labour used.

Notes and News

Farm Walk in Ireland

The Mushroom Section of the Agricultural Association of Ireland held a successful farm walk at the premises of Drummin Growers Ltd., Carbury, Co. Kildare.

The mushroom buildings were originally erected by the Irish Peat Board to house workers on a local bog. The mushrooms are grown on trays cased with peat and limestone chippings, and the produce is flown by air to Liverpool three or four times a week for sale in the North of England.

Mushroom Imports.

Provisional figures show that 1,298,000 pounds of mushrooms were imported by the United Kingdom in 1959. Of this total, approximately 98% came from the Republic of Ireland and of the other exporting countries, France, Germany, Austria and Holland, only the French made any significant contribution, and this amounted to 17,380 pounds.

Chelsea Show.

A sizeable corner of the N.F.U. exhibit of top quality vegetables at the Chelsea Flower Show was given over to mushrooms. Numerous chips of high quality mushrooms surrounded a setpiece showing a big mushroom about three feet across picked out entirely in button mushrooms.

Report on Russia.

D. G. Dalrymple of Michigan State University, U.S.A., has just completed a visit to Russian horticultural and agricultural projects and reports that by 1965 it is hoped to double the number of stores handling fresh fruit and vegetables. To meet the anticipated demand a Seven-Year Plan has been under

way since 1958 giving a 100% increase in the production of most fruits and vegetables, and quadrupling the production of grapes.

Retail prices are high in the Soviet Union, with apples at 10/- per lb., lemons 4/- each, and prunes at 9/- per lb.

Slot Machines.

Slot machines or, to use the modern terminology, vending machines, have been adapted by Mr. E. Bailey to sell fresh strawberries to travellers on the London to Cambridge road.

Mr. Bailey's firm, Henry Bailey, Ltd., is one of the largest growers, wholesalers and pre-packers in the country, and it was only to be expected that they would be first with this novel introduction. Certainly more and more things can be obtained from vending machines and there is no reason why pre-packed mushrooms should not be included on the list, if strawberries and fresh milk are there already.

VISITS TO OUR EXPERIMENTAL FARM

Requests by growers to visit our Experimental Farm have become so frequent this year that it has become necessary to restrict 'open days' to one day a week to prevent further dislocation of work and experimental schedules.

Would growers please note that we shall always be glad to arrange visits, but on Mondays only, and that they should notify us *in advance* of the date and time they have chosen so that arrangements can be made to receive them.

"The first essential for successful rapid composting is to get the water in early."

RAPID COMPOSTING

SOME NOTES BY
W. F. KEENS

Rapid composting has been tried by a number of growers with varying degrees of success. In this article Mr. W. F. Keens gives some practical hints to growers on the technique, writing from experience gained at Heather Farm, Woking, where intensive methods of cultivation are practised.

WHENEVER someone asks me how to do rapid composting I feel like giving Mr. Punch's advice to those contemplating matrimony—'Don't'. But I'll hedge that round by saying "Don't—not until you've got a clear idea of the process, and had some practical experience of the method as carried out successfully'.

I suppose the first question the reader will ask is why compost rapidly at all? Growers have been composting in a conventional way, taking three to four weeks about it for many years; what is the object of cutting this down to a mere week? The answer is that rapid composting dovetails into the fast production technique of the modern mushroom farm. There is, firstly, a saving of time, the lump going through the yard in roughly a week instead of four weeks. The second advantage springs obviously from this—the saving of composting yard space,

Mr. W. F. Keens, the author of this article.

Two or three times as much compost can be produced from the same area. Two further advantages of rapid composting are that, in my opinion anyway, a more even compost can be produced, and quite definitely considerably more footage can be produced from the same input of raw materials.

So much for the reasons why some growers compost rapidly, and here



Mushroom News

RAPID COMPOSTING—continued

Unloading the manure from a lorry into the first rough heaps.

I'd better say right away that it is no good considering rapids unless you have an efficient means of pasteurising. Pasteurisation is very much part of the production of a rapid compost, and a proper peak-heating room, with an adequate supply of heat and efficient means of ventilation are essential. But in these notes I intend to deal only with the composting process in the yard.

We find that you can use most sorts of horse manure for rapids although there is a good deal of difference in the way they are treated. Thus racing stable manure will require much more water when it comes off the lorry than will a heavier manure, but I have found that once it gets going it heats up as well as the heavier stuff, and what is more, does not necessarily require more supplementation with chicken manure. Of course if you can pick your manure, the best results will undoubtedly come from the material obtained from stables where the horses are both well fed and well bedded.

The first essential for successful rapid composting is to get the water in early. Get as much in as you can and the only way to judge this is by watching for leaching. Now I consider this leaching question most important, so I will go into it a bit further.

If you are watering the manure on the elevator of your turner you are bound to get quite a bit of run-off and this may be confusing, because I don't think a certain amount of run-off can be helped. But leaching comprises the trickles of dark brown or black liquid that run out from the bottom of the stack, and these



trickles are your indicators, showing whether you are putting in too much water. If there is *no* leaching, you are obviously not watering enough, and the ideal set-up is small trickles that run out about a foot from the heap and then come to a stop. A substantial flow of liquid away from the heap shows that you have overwatered and this state of affairs will have to be adjusted later.

As I have said before, the important thing is to get the water in as soon as possible, and this means thorough watering at the time of stacking, and at the first turn. There should be no need for water after that, but of course it is not always possible to get the compost just the way you want it, so you may have to add a little more water at later turns. The manure is watered as it goes up the elevator, and it is most important to ensure that it is in *shallow* layers so that the water has a chance to come into contact with every straw. Large clumps of straw thrown on the elevator will receive a superficial spraying with water and most of the matted material will remain bone dry.

In the system we use, the manure is thrown off the lorry into rough

RAPID COMPOSTING—continued

The stacked manure is here being put through the turner and wetted before shaping for the first turn.

heaps until a sufficient quantity is accumulated to form the next lump. Then, three to four days before the first turn is scheduled, the manure is put through the turning machine, thoroughly wetted in the process and stacked in a rough lump seven to eight feet wide by five to six feet high.

Here I would like to mention a point that sometimes gets overlooked when planning the through-put of a manure turner. It is the ultimate size of the lump that governs the size of the stack, and if you do not get your proportions worked out beforehand, you will get jammed between the unturned stack and the turned, shaped lump. That is to say, if your stack is too big, then the lump that is formed on the delivery side of the turner grows faster than you can eat into the compost. The working space gets smaller and smaller, and eventually the machine has to be drawn out to one side to do its job — and chaos ensues!

As I have said, the first turn takes place three to four days after stacking. Chicken manure has been laid along the top of the stack at the rate of 10% to 15% by weight and this gets mixed in as turning progresses. Water is added if necessary — and there should be very careful attention to this point. The lump is shaped to six feet wide by five feet high.

If the correct amount of water has been added the temperature of the



compost should be around 170°F. after 24 hours, and should reach 170° - 176°F. in 48 hours.

The second turn is given two days later and gypsum is added at 45 lb. to the ton. This time the lump is tapered down to five foot six inches wide by five feet high. Some water may still be necessary at this stage, but it is a question of visual observation, of a responsible person watching the dung as it goes up the elevator and applying a light spray to any dry patches. I cannot over-emphasise the importance of this question of watering. Somebody suggested that it ought to be possible to measure out the quantity of water required for a particular stack, and then apply it, but no two forkfuls of manure have the same moisture content, so it would be quite impossible to start laying down the law that 'so many gallons of water should be added to so much manure.' It is a matter of visual observation, practical experience and common sense. The only practical guide is to ensure that by the second turn at the latest water can fairly easily be squeezed from every handful of compost.

RAPID COMPOSTING—continued

The lump at the final turn. Note the polythene sheeting used as a wind break at the side of the composting yard.

After the second turn the lump temperatures should reach 170°F. in 24 hours and 170° - 173°F. in 48 hours, just a shade less than after the first turn, and holding until the third turn is carried out.

The third turn follows two days later and now the lump is cut down to four feet six inches to five feet wide and about five feet high. No water should be necessary at this turn, and the dung should present a uniform appearance and have a fairly good smell of ammonia. The last turn is given two days later, cutting down the size of the heap to 4 ft. 6 inches by 4ft. high. The temperature should rise to 165° - 170° F. and it should hold this temperature for the two days before the filling turn.

At filling, the manure is shaken out either by machine or hand, depending upon the circumstances, and is filled into the trays by fork. It is not tamped down but is levelled off and gently pressed with the back of the fork before being carried away for pasteurisation. The colour should be an even, dark brown, with very few green straws. A few uncomposted straws are unavoidable if machines are used for turning.

Summarising the turning schedule, we allow three to four days between stacking and the first turn and then two days between the first and the second turn. Two days elapse between the second and third turns, two days between the third and fourth, with a final two days to filling. From this it can be seen that total com-



posting time from first turn to filling is eight days.

In conclusion I would say that getting the water in, and stacking correctly, are the keys to successful rapid composting. The stacking method is very difficult to describe and needs quite lengthy discussion. Basically it requires that the centre of the stack is very loose, with the surfaces on the outside made air-proof with the exception of a small area at the base of the stack where air can get in and percolate evenly up through the loose centre and thence out through the loose compost on the top surface. But maybe more of that in another issue. On such a quick schedule there is no time to allow for repairing mistakes, and the compost has got to be right from the word 'go'. That is why I stressed at the beginning the importance of gaining experience from someone who is already successfully composting by this method. It will be a worthwhile experience.



Filling the trays by manual forking. The compost is given a good shaking out at this stage.



Mushroom Section, Glasshouse Crops Research Institute

OPEN DAY AT TODDINGTON

17th May, 1960

Mushroom research is spotlighted every year when the Glasshouse Crops Research Institute is opened for inspection by growers, and research workers explain what progress they have made in tackling the fundamental problems of mushroom growing. The 1960 Open Day was as interesting as ever, and attracted plenty of growers who wanted to find out what was going on.

Mushroom growers were well represented at the Open Day of the Glasshouse Crops Research Institute at Toddington, near Littlehampton, on the 17th May. Basic research has always had a deeper meaning to the mushroom grower than to other branches of horticulture—dare we say because he is more intelligent?—and the opportunity to cross-examine the scientific pundits has never been neglected.

Mr. F. W. Toovey, Director of the G.C.R.I. claimed that Miss D. G. Gandy of the Department of Mycology had made a major breakthrough in the investigation of Watery Stipe disease. She has proved that it is a real disease and

can be transmitted from affected beds to healthy beds, but at the moment one could only make a guess at the infective agent. It looked as though it might be a virus and if this proved to be so, then it would be the first time that a virus disease of fungi had been isolated. Not much is heard about Watery Stipe at the present time, but should it return to ravage the growing sheds, there will be a lot more known about it than last time.

Dr. N. W. Hussey of the Department of Entomology had some interesting conclusions on the subject of Cecids and their larvae. His department had proved definitely that no matter how great the Cecid

OPEN DAY AT TODDINGTON—continued

population of the compost might be, the yield was unaffected. The problem they had tackled was that of the contamination of the mushrooms by the Cecid larvae crawling up the stems to eat into the caps. It had been demonstrated that Aldrin in amounts as small as 10 parts per million in the casing material prevented the larva from climbing the stems. The difficulty now was to solve the problem of dispersing such small amounts of Aldrin evenly through the casing material, and work on this practical problem was being carried out at Fairfield. While Cecid larvae infestation is not at the moment a serious threat, it is comforting to know that should mass infestations occur again, a method of control is available.

Mr. P. B. Flegg's controlled environment chambers have now been built, and investigations into air-flow, temperature and humidity and their effect upon mushroom growth are under way. There are eight of these chambers, each containing four square feet of bed, and it is hoped to obtain valuable information on the ventilation of mushroom houses, the causes of deformed mushrooms, stroma and other disorders.

Of the three mushroom houses, one is being used by the Entomology Department for their work on Cecids and Phorids, and it is proposed to carry out shake-up and super-spawning in this house when a high

population of Phorid flies is artificially introduced to assess the relative hygienic values in the different spawning methods. The second experimental house is being used for work on Watery Stipe.

Growers will be interested in the trials being carried out in the third house under the Horticulture and Statistics Departments, including trashing, picking procedures and rate of spawning. After three experiments there does not appear to be any difference in yield between beds which were trashed at regular intervals and those which were not trashed. The opinion given is that trashing as a routine operation is a waste of time and labour.

The question of when to pick mushrooms produced the answer that plots picked when mushrooms were flats gave much higher yields than when the mushrooms were buttons, and the highest yield of all came from plots where the mushrooms had begun to turn up at the edges. However, as Mr. Flegg explained, the yield must be balanced against price, and the most economic yield came from mushrooms picked as cups.

Mushroom growers gather in the Mushroom Section to hear the experts' reports.



SERVANT OR MASTER

That is the Problem of Mushroom Mechanisation

by STANLEY MIDDLEBROOK

There is a danger that mechanisation of the processes of mushroom cultivation may become an end in itself and that medium sized growers will find that investment in costly machines does not yield the saving in costs that they seek. In this article, reproduced by kind permission of the Editor of the "Commercial Grower" Mr. Stanley Middlebrook discusses the correct approach to mechanisation.

WHEN discussing mechanisation in the mushroom industry we must think of composting as one part and the growing of mushrooms from that compost as the other.

The actual growing of mushrooms varies in method from farm to farm according to which one of the three possible systems is used, but composting is common to all. Let us deal with the growing part first.

I shall ignore the very large factory-type farm, where mechanisation is essential and indeed unavoidable, and the very small farm where it is impracticable. The factory-type grower knows all about it anyway, and anything I could say would be like a barrow boy talking to Isaac Wolfson. The small grower, even if he could afford a lot of machinery, would find it a crushing, top-heavy expense.

We are concerned, therefore, with the middle-sized grower—roughly between 10,000 and 75,000 sq.ft.

The system used governs the extent of mechanisation that is possible. In the following undetailed analysis I have divided mechanisation into conveying and processing and suggested how many times these can be applied in each system.

(1) Shelf System. *Conveying* — 1,

Processing — None. Compost can be conveyed from stack to house door, and there mechanisation stops.

(2) Tray System. *Conveying* — 5, *Processing* — 2. And still there is a lot of manhandling required—onto and off conveyors, into and out of position in growing room, etc.

(3) Portable Rack System. *Conveying* — 3, *Processing* — None. "Racks" are really shelves cut up into portable units. There's no manhandling of the racks at all, but neither is there any possibility of mechanised processing (so far).

If one were to assume that efficiency is measured by the amount of mechanisation possible, Systems 1 and 3 should be abandoned at once. The assumption would be false.

It is my firm opinion, as things are at present, if a standard compost could be offered to medium sized growers on each system and if equal cultural methods and treatment could be guaranteed, there would not be 2d. difference between the profits of the three systems.

You may hear of one tray grower doing exceptionally well, while

STER?

isation

A self-propelled, self-feeding manure turner of a type used in Sweden.



another with the same facilities doing badly (excluding, of course, the effects of disease and pest). The same with shelves or racks.

Ninety per cent of first-class cropping is due to a first-class compost and all systems will respond equally to it—or to any compost. It would be wildly wrong to state that because a system can be mechanised it is necessarily more profitable than one that is not or cannot.

A good grower isn't good because he uses a lot of machinery; he's good because he knows how to make a good compost, and exactly what he wants his machines to do.

Thus the wise man will only use a machine when he is absolutely satisfied that it can make as good as, or better, a job than that done by hand (remembering that the hand tires faster than a machine) or that in any given system, work can be done more quickly and cheaply without sacrificing its quality or seriously interfering with yields. The foolish grower adopts an attitude of "mechanise or die". So he mechanises—and often dies regardless.

One must not overlook the fact that if a very large grower is com-

pelled to mechanise, even the middle sized grower who contemplates expansion is working up to the same point, and will have to see that he is on the system which permits the desired amount of mechanisation.

There is very limited scope for processing by machine in our industry so far. Compost can be turned over, mixed, aerated and watered mechanically; trays can be spawned and cased by machine, but all the rest of mechanisation is in conveying.

The means of conveying are in the main readily available, and their profitability is pretty well self-evident. Lorries, vans, tractors, fork lifts, conveyor belts and rollers, mechanised barrows and so on: all these things speed up and lighten work. All the grower has to do is to decide what he can afford and if he has enough use for the machines to justify the cost.

Processing, on the other hand, demands great thought and invention, prototypes must be made and tried out, and patience and capital are both required in good measure. All efforts are almost bound to result in "one-off" types, as there is no scope for mass production.

SERVANT OR MASTER—continued

Fork lift trucks have become standard equipment on many of the larger mushroom farms.

It has been said that given enough money a machine could be made to do almost anything. But there's the rub—the cost. And not only the cost of the machine, but the continuing cost of getting it into and out of its working position day by day or week by week (according to farm size).

A shelf grower would sit pretty if he could invent an economical machine for filling and emptying his houses, but the cost of any machine he can think up, plus the time taken up in positioning it each time a house is filled and emptied, entirely rule it out as a possibility. It is probably this one fact more than anything else that has turned many growers over to trays.

Tray men would like to cut out completely all manhandling of trays, either full or empty. Rack and shelf growers would like to be able to spawn and case mechanically.

It would be an advantage to mechanise ventilation, watering, picking and packing, pest and disease control, if machines could be invented to do these jobs with the discrimination required. All these jobs may one day be operated from a central push-button control panel in the office, aided by a battery of closed-circuit TV. cameras.

Similarly with composting. The future may cut out stack-composting as we know it now, the operation being done in controlled vats or revolving drum where some scientific process can be watched on dials.



Or we may not even use compost at all, but perhaps some nutrient solution. In the meantime, we must face the present.

Now, briefly, for composting. Every grower must prepare a compost and it is the most important work on the farm, requiring most attention (though very often given least). It is a wickedly wearying and wearing job unless mechanised. But, alas, the more we try to mechanise it the more inefficiently is it done, and all progress in invention is bedevilled by this knowledge. No current machine can discriminate.

Every grower knows that ideally compost should be "graded", that is, the outsides of one stack should go to the middle of the new one, top to bottom, anaerobic area to aerobic.

Watering and consolidation are, or should be, a matter of judgment with almost every forkful turned over. But this kind of perfection can only be aimed at by hand and is abandoned when machines are used.

Hopes of correcting badly made compost are left to the pasteurising stage where it is supposed that an evening out process takes place.

In all probability many failures are due to relying too much on this final pasteurising stage, which in theory is ideally controllable, but in practice is very tricky and too frequently goes wrong. It appears to be accepted by many that the risks and losses involved are balanced by the advantages of mechanical stack turning.

My own preference is for making a compost right before it goes into the house, thus avoiding the pasteurising risk. I use the following example to show that mechanisation has its pitfalls and that middle sized growers at any rate should put the job first and mechanisation second.

Making Compost

For two years we have used a specially-adapted muck spreader for all turns. It does a quick job, aerates and mixes very well, and partially makes its own stack. One man feeds it with a tractor and two others shape the stack. We have

now abandoned it for all turns except the last, at which we only want aeration and mixing.

We are getting a better compost by using only the tractor fork to convey it from one stack to another, where it is dropped between movable side racks and positioned by two men. Still only a three-man job

Labour costs and shortage, shorter hours, and expansion (which will eventually kill the golden-egg-laying goose) are forcing growers to mechanisation, and mechanisation to justify itself means still more expansion with more mushrooms grown at less profit per lb. (supply beating demand).

Instead of mechanisation being a means to an end—to grow mushrooms better and more cheaply—mushrooms are to be the means to the end of mechanisation and large scale industrialisation. Our mushrooms might as well be tin cans, spark plugs, champagne corks or rubber grumets. We are becoming a nation of mushroom engineers!



Most mushroom farms use some form of manure turner nowadays and it is debatable whether the resulting compost is equal to that obtained from hand-turning the compost.

"Let somebody be firm, construct or re-design a house, put in a mechanical picking and packing layout. If anything is to be done about solving the problem it requires a complete reorientation of ideas."

PICKING MUST BE MECHANISED

by

ARTHUR BOTTRIS

Picking the crop is sometimes more of a headache to the successful grower than growing it. In this article the author sets out some thought provoking ideas that are worth consideration by those growers faced with the dual problem of too many mushrooms and too few pickers.

THERE was a time when there were almost as many men as mushrooms on a mushroom farm, but the relentless pressure of costs has forced the modern mushroom grower to find ever more mechanical handling devices capable of replacing man-power. In fact, it is possible on paper to sketch out a mushroom farm that could be almost completely "push-button" operated, with radio-controlled Linfield Turners, automatic filling, spawning and casing, and even watering by mist sprayers.

But picking the crop has defied every attempt at mechanisation. There must always be available a

pool of labour capable of clearing the beds in the shortest possible time. Picking is surely the Achilles Heel of the mushroom industry, and the ever-recurring problem of removing a heavy crop as quickly as possible is the one that seems insoluble.

Moreover it is a problem that is likely to get worse, for modern cultural tendencies result in increasingly heavy first flushes and unless these are cleared quickly, subsequent cropping will be delayed. The unfortunate grower is busy reducing labour at one end of the farm while finding himself at his wits' end at the other to get enough pickers. Mushrooms being what they are, there are never



PICKING MUST BE MECHANISED—continued

enough pickers on four days of the week and never enough mushrooms on the other three. Whole time pickers are employed for only part of their time, and part-time pickers are frequently changing their jobs, having babies, or just forgetting to turn up.

It has been axiomatic that you cannot mechanise picking. It is the one job on the farm that the machine cannot do until some sort of free-standing mushroom on a three-inch stem is produced capable of being harvested. Picking is picking and that is that.

Or is it? Let us break down the picking (and packing) operation into its component parts. First the mushroom is picked — that is to say it is taken in the fingers and its connection with the bed forcibly severed. It is now free of the bed. This comprises the picking, and from now on comes the packing operation.

The mushroom is trimmed, and the stem removed. This can be done at the time of picking or later in the packing shed. Then it is graded, again an operation performed on the spot or in the packing shed, the packs are made up, weighed, lidded and prepared for despatch.

All this involves a considerable amount of movement to and fro, replenishment of empty chips, carriage of the chips from pickers to collecting points, to packing houses and so on. Some growers are more efficient than others, and by means of work study have saved a lot of picker-hours. Nevertheless the operations sketched above give a general idea of the problem of picking.

Now let us suppose we have unlimited capital available for produc-

ing a mechanised method of picking. How to go about it?

Looked at in detail, the *only* operation incapable of being mechanised to-day is the actual picking—the breaking of the mushrooms' connection with the bed. Just that one small task—a twist and a tug—defies mechanisation, and short of training animals to do it, must be performed by men or women.

But if all the pickers have to do is to twist and pull the mushrooms clear of the beds as though they were weeds, how much faster they can move. In fact, paid by results, a team of four men could remove every mushroom in even the heaviest of first flushes in a remarkably short space of time. The essential factor is that these men are specialists in twisting and tugging; not for them the niceties of grading, trimming and packing. From an early age they know only one job—how to get mushrooms off beds at the rate of one a second for eight or ten hours a day.

As each picker scampers over the trays with the agility born of years of practical experience he carries with him the end of a moulded rubber chute. Picked mushrooms, stem, root, the lot, roll down the chute on to a rubber conveyor belt running the length of the house, and are carried to the door.

The position, height, angle and speed of the conveyor belt can be left to the specialist pickers. They are paid by results and they know exactly where they want the conveyor, and what is more, they will set it up or move it from house to house with the utmost rapidity to shorten the delay before they can get back to whipping mushrooms off beds.

PICKING MUST BE MECHANISED—continued

Washing mushrooms on the Ronjon system, as practiced at Wrington Vale Nurseries.

The conveyor belt should have a V-section and as the mushrooms are carried in a series of jerks down the house, the stems and roots fall down into the bottom of the V, suspended there by the caps. Thus they are positioned nicely for automatic feeding into the trimming machine.

Forms of trimming machines are already in operation in the U.S.A. The mushroom is held in rubber lips while rotating past a blade that neatly trims the stem to the desired length. So our mushroom, having been touched but once and then only for a brief second, is now neatly trimmed and at the end of the house.

The mushrooms have, however, received quite a bit of bumping about in their travels, and they are due for a bit more before they are through. So at this stage we must ensure that they have a good shelf life and do not go brown before they are even off the farm.

Therefore as they leave the trimming machine they are dunked in a tank of iced water to remove the house heat. Do not forget that they are probably at 65 to 70°F. and if we are to slow down the natural processes that lead to browning we must get them down to 40 to 45°F. pretty smartly. A few turns round a bath of iced water should cool them off. Perhaps the detergent wash can be included in this pre-cooling process, perhaps it is necessary for them to pass through a detergent



tank and a rinse tank. Anyway, they emerge nicely cool and beautifully white on an elevator that passes them on to a sorbo rubber belt on which they are dried.

You will note that there is still no labour involved. Our clean white mushrooms, excess water removed, travel on a belt into the packing department. And here, anyway for the present, a human hand is required—or rather four or more fingers. As the mushrooms, thinned down to single file, pass a girl, she presses a key which automatically deflects the mushroom into its correct grading — buttons, cups, opens, roughs. There it falls into a chip and when the chip (or prepack) reaches the predetermined weight, it is pushed out of the way by an empty chip waiting to be filled.

The human element must enter into the grading of mushrooms; it would not be possible to use a size grader such as is used for fruit or tomatoes. Mushrooms are graded by their state of development, which is independent of size, and this can only be decided by visual observation. The grading girl would have to

PICKING MUST BE MECHANISED—continued

be pretty fast with her fingers, but no faster than a good touch typist or G.P.O. letter sorter, and when fully trained she would be as valuable and highly-paid as a chick-sexer. But then think how many people's work she would be doing!

No doubt our packaging experts could devise a chip and cover that could be automatically stapled together. All that remains is for the chips to be removed by fork lift to the waiting lorry. Ideally the mushroom houses have, throughout their journey, been touched by only one pair of fingers, and apart from the girl at the automatic grader, no other workers are required beyond the specialist pickers.

Of course this is all a lot of nonsense, and obviously no one will take it seriously. There are so many excellent reasons why the whole thing is impractical. For a start, none of the bigger growers do it anyway.

And why not? Because they can't! Because picking has been the Cinderella of jobs of the mushroom farm for years. Houses are designed—well what *are* they designed for? Why are they usually 18ft. span? A grower builds a house the way he does for a number of good reasons, but convenience of mechanical picking is not one of them.

Yet to-day he suddenly finds himself faced with the problem of picking in great big letters. He has got to do something about it or he will have the 20th Century governing three-quarters of his operation and the 12th Century governing the rest.

For a start growers must include picking as a factor in the design of a mushroom house, in the design of

the trays, in the layout of gangways. As from now, any mushroom house built without due consideration being given to mechanised picking is out of date.

Secondly, growers faced with picking problems—and there are a number of big growers who know just how serious this problem is going to be—should ask themselves whether they are being sufficiently ruthless in their approach to the subject.

Work study is all very well, but it is really only trying to improve an antiquated method of tackling a 20th Century problem. What is required is a completely new approach to picking, and if this means ripping the insides out of an old house, or pulling it down and rebuilding it twice as wide or half as wide, then it will have to be done.

The modern grower will have to do some pretty fine balancing if he is to give due weight to all the factors concerned in mushroom farm



The end product. Can the hand be removed from the picking and packing process and still give a high quality sample?

PICKING MUST BE MECHANISED—continued

design. For instance, there is a good case to be made for having open-stacked trays canted at an angle. With built-in corner pegs they will be no more difficult to handle, yet the fact that mushrooms are just that much more accessible will speed up picking.

Then there is the question of the bottom one or two layers of trays; to pick these over requires either a very short dwarf or someone used to working on their knees. Now various pundits have produced figures for the bed-air relationship in a mushroom house, but no one has said anything about *where* the beds should be. Consequently in nine out of ten mushroom houses there is a five or six foot gap between the top trays and the roof, yet the bottom trays are on the floor. Why not lift the whole lot up three or four feet into the air, so that the bottom trays can be picked easily? The bed-air ratio remains the same, some form of steps or trestles have to be used any way to get at the top trays, and the bottom trays have been lifted

from the coldest part of the house. It is worth a try.

We are told that in America left-handed labourers command a special wage-rate because they can be used in a working space with a right-handed man when two right-handed men would get in each other's way. Is there a premium for long-armed pickers? People with exceptionally long reaches, ambidextrous people, or combinations of the two are of exceptional interest to mushroom growers.

Saving one-fifth of a second per second on a job does not sound very much and hardly worth the bother of finding a man with long arms, or selecting a left-handed man to work on the left-hand side of the house. But one-fifth of a second saved represents *ninety-six minutes* saved in an 8-hour day—almost a complete day saved in every week.

The biggest difficulty in the way of mechanising the picking of mushrooms is that the sort of farms where some form of conveyor belt line could be installed are not sufficiently modern to allow such a system to be installed. Modern in every other way, they still rely on armies of pickers to clear the beds, and recruits for the armies are gleaned from other countries, collected by motor coaches and cars, cossetted and fussed.

Let somebody be firm, construct or redesign a house, put in a trial mechanical picking and packing layout. If anything is to be done about solving the problem of picking and packing it requires a complete re-orientation of ideas. And whoever the grower is who cracks the nut, he will rank among the big names of the industry.

The corner of a packing shed. This is a scene that has not changed in twenty-five years.





Some items of interest from our Postbag

Effective Peak Heating

You have identified Vert-de-Gris in the compost sample I sent to you, but I am quite certain that I had a good peak heat and the trouble should have been eliminated. Can you offer an explanation?

A number of factors enter into correct peak heating or pasteurisation and unless each of these is satisfactorily dealt with, the final result, while superficially "good", may fall far short of what is to be desired.

It is important to see peak heating in the right perspective; primarily it is a continuation of the composting process under controlled conditions of temperature, ventilation and humidity. Its object is to ensure a maximum build-up of food materials in the compost by ensuring an even and regular heat treatment. Advantage is taken of this even heat distribution to kill off pests and diseases.

We know of farms where an apparent peak heat is obtained; air temperatures are correct, samples of bed temperatures are correct, yet pests and diseases are *not* eliminated and cropping remains poor. In such

cases a careful analysis of peak heat conditions should be made along the following lines.

The manure should be filled slightly "green", a condition obtained if the heap is given one less turn than usually considered normal. There is then a residue of latent fermentation present at filling and the compost will heat up again in the house. To help this natural heat, the house should be thoroughly warmed by turning on the heating some considerable time before filling is scheduled. Finally, filling should be treated as a "rush" job and the work completed as speedily as possible. By doing this the compost is given no chance to cool down and enters the house at the same temperature as the heap.

It is necessary to augment the heat in the house by means of gilled tubing, steam, braziers, or unit heaters, and these auxiliaries should be brought into use *at once* while the temperature of the compost is still rising naturally. In this way the *compost* temperature lags very little behind the air temperature.

With these conditions carried out, success in peak heating will depend upon heat penetration of the compost. At 140° F. a *minimum* of 24 hours will be required and most compost samples require not less than 48 hours and this may be extended to 56 or even 72 hours. The condition of the compost will govern the rate of heat penetration; a short, greasy compost, filled with unbroken droppings, or a tightly packed compost will resist heat penetration and a very long period will be required if all parts of the compost are to reach the minimum temperature laid down.

You will appreciate now that it is possible—even probable—that while

QUESTION BOX—continued

most of your compost has been correctly treated, parts have resisted heat penetration. These parts may form centres of infection from which disease or pests spread very rapidly through the otherwise pasteurised medium.

Bacterial Spot

You would expect bacterial spot to occur in parts of the house furthest from ventilators where the air is stagnant, but I get trouble just inside the doors.

The area just inside the door of a mushroom house is often the scene of special troubles, for it is here that conditions outside the house impinge on interior conditions. If it is wet or foggy outside you will find that the atmospheric humidity is much more apparent over the beds just inside the door, with a consequently greater incidence of bacterial trouble if the bacteria are already present. During the winter months when cold conditions prevail outside, the cold air entering the house may cause chilling near the door, and a sharp rise in atmospheric humidity will also encourage bacterial development.

Measuring Humidity.

I want to keep a record of the humidity in my sheds. Do you recommend the whirling hygrometer or the hair hygrometer?

The hair hygrometer gives you a direct reading of the relative humidity in your shed by means of a dial and pointer. It is therefore much easier to read, and a number of readings can be taken in various parts of the shed in a comparatively short space of time. The hair hygrometer is, however, a delicate machine, with an intricate mechanism, and if dropped or damaged, may give a false reading that will be taken as correct.

The whirling hygrometer consists of two accurate thermometers in a wood case, one of which is kept moist by a small reservoir. It is whirled in the air, and then the readings of the two thermometers are taken and their difference compared with a chart to find the relative humidity.

Briefly, the hair hygrometer is easy to read, but must be treated with care. The whirling hygrometer is more robust, but it takes longer to obtain a reading.

Basudin.

What safety precautions should I take when using Basudin in my houses? How long should I allow between using Basudin and picking the crops?

The Basudin range of formulations have diazinon as the active ingredient, and this is an organo-phosphorus chemical. While diazinon is relatively non-lethal to human beings, it is advisable in your own interests that your work-people should take certain precautions when using it, as with all other organo-phosphorus compounds.

A Martindale face mask should be worn at all times when using Basudin, whether dust or aerosol, and it is worth while reminding workers that masks should be worn when filling equipment before use, or cleaning it afterwards. It is important to see that foodstuffs such as sandwiches are not exposed in the same shed as Basudin is being handled. It is advisable to wash the hands after using either the dust or the aerosol, and this is essential if drops of the aerosol have touched the skin anywhere.

With regard to the application of Basudin, two clear days should elapse between using the insecticide and picking the crop.



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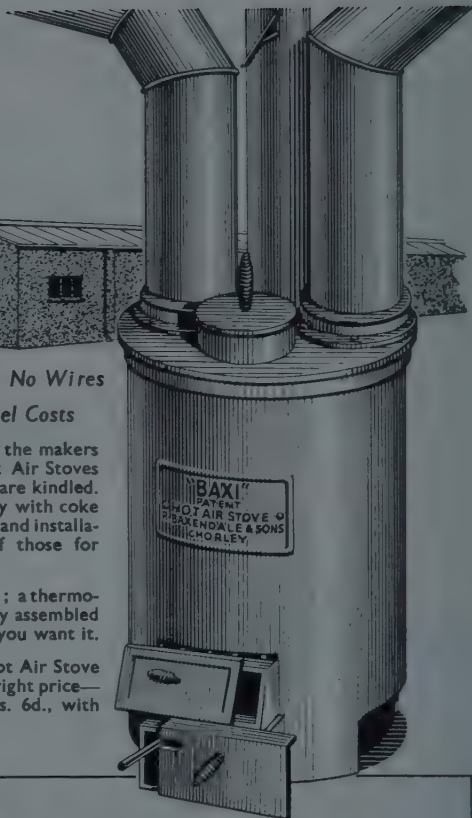


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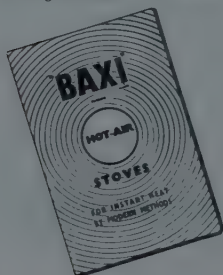
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Covent Garden

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FRED BRIDGE, Smithfield Market, Manchester 4 Tel.: Deansgate 4835 & 2802. Telegrams: Fred Bridge, Manchester. Established 1888

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